June 5, 1890.

The Annual Meeting for the Election of Fellows was held this day.

Sir G. GABRIEL STOKES, Bart., President, in the Chair.

The Statutes relating to the election of Fellows having been read, General Clerk and Dr. Gladstone were, with the consent of the Society, nominated Scrutators to assist the Secretaries in examining the lists.

The votes of the Fellows present were then collected, and the following candidates were declared duly elected into the Society :—

Baker, Sir Benjamin, M.Inst.C.E.
Bosanquet, Robert Holford Macdowall, M.A.
Burbury, Samuel Hawkesley, M.A.
Gardiner, Walter, M.A.
Kerr, John, LL.D.
Lea, Arthur Sheridan, D.Sc.
MacMahon, Percy Alexander, Major R.A.
Norman, Rev. Alfred Merle, M.A.
Perkin, Professor William Henry, jun., F.C.S.
Pickering, Professor Spencer Umfreville, M.A.
Roberts, Isaac, F.R.A.S.
Sharp, David, M.B.
Teall, J. J. Harris, M.A.
Thorne, Richard Thorne, M.B.
Weldon, Walter Frank Raphael, M.A.

Thanks were given to the Scrutators.

June 5, 1890.

Sir G. GABRIEL STOKES, Bart., President, in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read :—

I. "Account of recent Pendulum Operations for determining the relative Force of Gravity at the Kew and the Greenwich Observatories." By General WALKER, C.B., F.R.S., LL.D. Received April 15, 1890.

(Abstract.)

It is well known that a series of pendulum observations was carried on in India, during the years 1865 to 1873, with two invariable pendulums, the property of the Royal Society. The Observatory of the Royal Society at Kew was chosen as the base-station of the operations, and the pendulums were swung there before being sent out to India, and again on their return from India. With a view to connecting the observations with those which had already been taken with other pendulums in other parts of the world, it was intended, on the return of the pendulums from India, to swing them at the Royal Observatory at Greenwich, which was a well established pendulum station, observed at by General Sir Edward Sabine, the Russian Admiral Lütke, and others. But when the time arrived for making the observations at the Greenwich Observatory, such extensive preparations were being made there for the equipment of expeditions for the observation of the approaching transit of Venus that no room was available for the pendulum operations. It was, therefore, decided to make the connexion with Kew by swinging at Kew Kater's convertible pendulum, for determining the absolute length of the seconds pendulum, which had been swung 40 years previously at Greenwich by General Sabine. This being done, the length of the seconds pendulum at Kew was found to be 0·0027 of an inch greater than the length which had been previously determined at Greenwich, and consequently that the daily vibration number was three vibrations greater at Kew than at Greenwich. The difference, however, was far too large to be admissible, as the observatories are nearly in the same latitude, and differ very slightly in height.

In 1881 Colonel Herschel, R.E., was deputed by the Secretary of State for India to take pendulum observations at the two observatories, and at the old pendulum station in London, and also at some stations in America, with a view to improving and strengthening the connexion between the observations in India and those in other parts of the world. On completing his work in America, he handed over the three pendulums which he had employed to officers of the United States Coast and Geodetic Survey, by whom they were taken round the world and swung at Auckland, Sydney, Singapore, Tokio, San Francisco, and finally at Colonel Herschel's terminal station at Washington.

But when the observations came to be finally reduced, it was found that the difference between Colonel Herschel's results at Kew and Greenwich, as shown independently by the three pendulums, had an extreme range of about seven vibrations in the daily vibration number. The cause of these differences was mysterious and inexplicable, and there was no alternative but to swing the pendulums a second time at the two observatories.

The revisionary work was undertaken by the observatory staff at each place, in such intervals of leisure as they could obtain from their regular operations. The final results, by the three pendulums, make the vibration number at Kew in excess of that at Greenwich by 1·56, 1·50, and 0·59, giving an average excess of 1·22.

The correction to this quantity for the excess of height of the Greenwich over the Kew Observatory is −0·58. Thus, the revisionary operations, reduced to the mean sea-level, make the excess of Kew over Greenwich = 0·64 of a vibration, which may be accepted as very fairly probable.

II. "Observations on Pure Ice."—Part II. By Thos. Andrews, F.R.S., M.Inst.C.E. Received May 1, 1890.

The Plasticity of Ice.

In a paper, 'Roy. Soc. Proc.,' vol. 40, 1886, p. 544, I recorded the result of "Observations on Pure Ice and Snow," and having subsequently had occasion to use large quantities of low temperature freezing mixtures in the prosecution of other investigations, it seemed desirable to take advantage of the opportunity, and to further utilise the freezing mixtures in making collaterally the following additional experiments bearing on some of the plastic or viscous properties of ice at various temperatures. Messrs. J. C. McConnel and D. A. Kidd, in their valuable and interesting paper on "The Plasticity of Glacier and other Ice" ('Roy. Soc. Proc.,' vol. 44, 1888, p. 331), remark that "the variation of the plasticity of ice with the temperature is of great interest both for the theory of glaciers and for the explanation of the plasticity itself." I hope, therefore, that the experiments now recorded may assist in affording some information in connexion with this subject. An acquaintance with the causes of the flow of glaciers can scarcely be complete without some accurate experimental knowledge of the plasticity of ice at various temperatures, and it was partly with this object that the following experiments were commenced. The experiments form a continuation of those contained in my former paper. The arrangement of apparatus is described below, and illustrated by the accompanying sketch, fig. 1.